ONTARIO MINISTRY OF ENVIRONMENT
36936000021265

ASSESSMENT OF 1976 PEAT HARVESTING ACTIVITIES ON WATER QUALITY

ARCTIC PEAT MOSS LIMITED
UNORGANIZED TOWNSHIP OF CARPENTER
DISTRICT OF RAINY RIVER

MOE
CARP
ASS
ASJK

c.1
a aa

Ministry
of the
Environment

Ontario

ASSESSMENT OF 1976 PEAT HARVESTING ACTIVITIES
ON WATER QUALITY

ARCTIC PEAT MOSS, LIMITED

UNORGANIZED TOWNSHIP OF CARPENTER

DISTRICT OF RAINY RIVER

Industrial Abatement Section

Technical Support Section

Northwestern Region

MDE
CARP
ASC
ASJK

ASJK

INDEX

Page

Introduction 1

Summary 1

Details of Survey 2

Personnel Participating 2

Chief Company Official 2

Boreal Mires 2

Harvesting Areas 4

Harvesting Methods 5

Drainage Patterns at the Emo Plot 5

Sampling and Analysis 6

Results and Discussion 8

Conclusions 11

References 12

Photographs 13

Appendices

Maps

Analytical Results

Digitized by the Internet Archive
in 2015

https://archive.org/details/assessmentof197621265

INTRODUCTION

At the request of the Regional Director, North-Western Region, a survey was conducted by staff of the Industrial Abatement and Technical Support Sections to determine the potential impact of peat moss harvesting on local watercourses. Arctic Peat Moss Limited produces bagged sphagnum peat moss for retail use and began operations at its process facility in Barwick, District of Rainy River in 1974. Raw moss is obtained from a harvesting area located in the Township of Carpenter, north of Emo, and is trucked for further processing to the Barwick plant.

A large peat harvesting operation for the production of energy is being contemplated by the Minnesota Gas Company for peatlands located in Northern Minnesota. Such an operation, if brought into production, would be much larger than that being conducted by Arctic Peat Moss Limited. The purpose of this investigation was to collect and analyze information which might be useful in evaluating the potential environmental effects of a major operation as well as the actual environmental effects of the Artic Peat Moss Limited harvesting operations.

SUMMARY

The artificial chemical loading that Everett Creek experiences from the drainage ditches of the Arctic Peat Moss harvesting operation is measurable but environmentally insignificant. As the discharge from the ditches moves down

stream, natural biochemical degradation and dilution further reduce the physico-chemical influence from a development of this magnitude.

DETAILS OF SURVEY

Personnel Participating

Personnel participating in the program were:

- J. Barr, Senior Environmental Officer
  Industrial Abatement Section
  Kenora District Office
- R. Varey, Environmental Technician
  Technical Support Section
  Thunder Bay Regional Office

Chief Company Official

- Mr. A. Gil, Manager
  Arctic Peat Moss, Limited
  Barwick, Ontario

Boreal Mires

The peatlands associated with the Township of Carpenter harvesting operation are part of a vast complex of blanket type mires, covering whole landscapes (Radforth, 1958). The particular location is synonomous with glacial Lake Agassiz. Heinselman, 1963, has described this area as including large expanses of "patterned fen" and "string bogs".

Patterned fen: A wet low-land area having alternate, more or less parallel, peat ridges and hollows orientated across the slope, ie. at right angles to water movement.

String Bogs: Circumboreal class of patterned bogs having more or less parallel bog ridges, separated by wet hollows. In some regions the ridges join to form nets. Ridges lie across the slope, at right angles to water movement.

The plants associated with boreal mires are commonly known as peat mosses. The scientific name is Sphagnum and the distribution is almost cosmopolitan, extending from the tropics north and south through temperate zones to sub-arctic and sub-antarctic regions. They are aquatic or semi-aquatic plants which grow in dense masses or cushions in swamps, ponds and lake margins, moist heaths and moor lands.

It has been established that in the metabolism of Sphagnum certain acids are liberated, due to decomposition of the small quantities of salts by Sphagnum cell walls. By creating acid conditions unfavourable for Fungi and Bacteria and owing to the absence of free oxygen, the normal action of decay bacteria in Sphagnum bogs is slowed down to the point where decay of the dead tissue is retarded. Thus a constantly increasing mass of dead but partially decomposed tissue, along with other plant remains, accumulate from year to year. It is slowly compressed by increasing superincumbent weight of fresh layers of dead tissue above it, and eventually hardens into a compacted dark coloured substance

rich in carbon and known as peat, hence the name peat mosses (Parihar, 1970).

Harvesting Areas

The Company has access to two peatland areas, one known as the Stratton plot in the Township of Patullo and the other known as the Emo plot in the Township of Carpenter. The Company leases all areas of the Stratton plot from the Crown under a Ministry of Natural Resources Land Use Permit. Sections of the Emo plot are also leased from the Crown while the remainder is owned by the Company. The Stratton plot has never been utilized for harvesting; 1976 harvesting was conducted at the Emo plot only.

In addition to the lots leased from the Crown or owned outright by the Company, other peatlands owned by the Crown in the area of the Emo Plot are being tested to determine their suitability for future harvesting development. Map number 1, Appendix I, shows the location of the harvesting and test areas enclosed by the Emo Plot.

Based on chart projections, the Company has cleared about 930 acres of peat lands for harvesting, has immediate access to a further 310 acres which are presently uncleared, and has available another 1150 acres which are undergoing development testing. The total peat area in the Emo plot available for the Company for development is approximately 2400 acres or 3.7 square miles; the Stratton plot area encompasses 400 acres or 0.625 square miles.

Harvesting Methods

The purpose of proper harvesting of the sphagnum moss is to produce as dry a raw material as possible. This reduces energy requirements resulting in economic savings at the cleaning and drying process plant located in Barwick.

In general, the moss is harvested by pushing surface layers up into piles for preliminary atmospheric drying by sun and wind. Drainage ditches located around the perimeter of the harvesting area aid in controlling the moisture content of the peat by lowering the water table to a point approximately 24 inches below the peatlands surface elevation. The partially dewatered raw moss (78-90% by weight water) is then trucked to the Barwick processing plant for cleaning and drying to produce a final bagged product (50% by weight water).

Because of the severe winter climatic conditions, the peat can only be harvested during the warm weather months, generally June to September. Piles of the moss are therefore stocked during the summer and subsequently removed to the Barwick plant in the winter when trucks can drive over the frozen peatlands.

About one and one half inches of surface moss are removed annually from those portions of the Carpenter Township bog site which are being harvested.

DRAINAGE PATTERNS AT THE EMO PLOT

The Emo Plot is intersected by a Township road known locally as the Barnhart Road. As previously described,

water levels in the harvesting area are controlled by drainage ditches. In this case, a roadside ditch immediately east of the Barnhart Road controls levels of the eastern peatlands, while a similar ditch, west of the Barnhart Road controls levels of western peatlands. The east drainage ditch discharges to the west ditch via a culvert located under the road.

Both east and west drainage ditches form the headwaters of a tributary of Everett Creek, which discharges to the Rainy River west of the Municipality of Emo, about 6.6 water miles from the harvesting area.

Everett Creek flows through what is essentially an agricultural area, mainly consisting of cattle farms. According to a 1966 Department of Energy, Mines, and Resources map of the area, about 18 individual farm settlements are located within 600 feet of the creek and/or its tributaries.

The Company has been planning construction of additional control ditching throughout the Emo plot and, if these plans are carried out, the peat harvest area may in future, also drain towards two other local watercourses, the LaVallee River and Lyon Creek.

Map Number 2, Appendix I, shows the drainage patterns at the Emo plot.

SAMPLING AND ANALYSIS

A total of seven water quality sampling sites were selected for both accessibility and significance in determining

the effects of harvesting operations on local water courses. Generally, samples were collected by direct immersion of 32-ounce or 1-litre glass bottles below the surface of the watercourse. On occasion, it was necessary to extend, by means of a rope, a plastic "jug" into the watercourse. The sample so collected was then transferred to 32-ounce or 1-litre glass bottles.

The filled bottles were capped, labelled, and shipped by bus to the Regional Laboratory in Thunder Bay for analysis of:

free ammonia as N
total kjeldahl nitrogen as N
nitrite as N
nitrate as N
total phosphorus as P
hardness as $CaCO_3$
alkalinity as $Ca\ CO_3$
conductivity
acidity
pH

Separate samples for tannic acid and lignins analyses were air shipped from Fort Frances to the Ministry laboratory in Toronto. All analyses were conducted in accordance with procedures outlined in "Standard Methods for the Examination of Water and Wastewater", 13th Edition.

Six sets of seven samples each were collected during the 1976 harvesting season, May 7, May 18, June 28, July 27, August 16, and October 12.

In addition, some of the collected samples were analysed for apparent colour and turbidity while a portion of the samples collected on July 27, August 16, and October 12 were shipped to Toronto for tannic acid and lignins analyses.

On the basis of location, the sample sites are presented as follows:

Site #	Site	Site Description	Representation
1	Everett Creek	Upstream	Control
2	Drainage Ditch (mire water)	West	Influence
3	Drainage Ditch (mire water)	East	Influence
4	Everett Creek	1 mi. Downstream	Receiver
5	Everett Creek	4 mi. Downstream	Receiver
6	LaVallee River	Upstream	Comparison
7	LaVallee River	1 mi. Downstream	Comparison

Map number 3, Appendix I, exhibits the location of the sampling sites in relation to the harvesting site.

The upstream site on Everett Creek (number 1) represents the "control" - water indicative of natural stream conditions. The two downstream sites on Everett Creek (numbers 4 and 5) "receive" the "influence" of the harvesting operation.

The sites on LaVallee River (numbers 6 and 7) represent a "comparison" of upstream and downstream surface water which does not experience drainage ditch discharge.

RESULTS AND DISCUSSION

The parameters selected for chemical analysis and commonly utilized as quality indicators are natural components

TABLE I

SAMPLED PARAMETERS - MEAN CONCENTRATIONS *

No. of Samples	Parameter	Site Number						
		1	2	3	4	5	6	7
6	Ammonia as N	0.07	22.16	75.00	0.10	0.08	0.02	0.04
6	Kjeldahl Nitrogen as N	1.4	1.7	2.3	1.8	1.6	1.2	1.1
6	Nitrite as N	0.022	0.022	0.021	0.023	0.022	0.009	0.009
6	Nitrate as N	0.03	0.02	0.02	0.03	0.02	0.01	0.01
6	Phosphorus as P	0.059	0.061	0.055	0.064	0.097	0.038	0.051
6	pH	6.5	5.7	6.0	6.1	7.0	6.6	6.6
6	Hardness as $CaCO_3$	86	82	107	82	134	70	103
6	Alkalinity as $CaCO_3$	63	67	90	83	86	83	103
6	Calcium	28	26	34	26	43	22	33
6	Magnesium	17	17	21	17	27	16	21
1	Conductivity	88	56	61	84	142	114	126
6	Acidity	10	20	28	9	7	12	7
3	Tannins	7	16	18	13	11	4	4
3	Lignins	17.5	40	45	32.5	27.5	10	10
5	Colour	>70	>70	>70	>70	>70	>70	>70
5	Turbidity	12.1	2.2	1.4	10.8	18.2	1.3	1.9

* All units are in mg/l except for: pH in pH units; conductivity in µmhos/cm; colour in hazen units; and turbidity in formazin turbidity units

of water. The results from the analyses are provided in Appendix II and a summary of means is presented in Table I, page 9.

It is apparent from the data that the receiver stream, Everett Creek, experiences a measurable influence from the Arctic Peat Moss harvesting operation. The artificial introduction of mire water increases the level of concentration for several indicators. Specifically, in comparing the "control" site to the primary "receiver" site (number 4), no significant influence is evident for the majority of the parameters. However, free amonia (NH_3), total kjeldahl nitrogen (TKN), tannic acid, lignins and pH exhibit a corresponding rise or fall in concentration in direct relation to the higher or lower concentrations in the drainage ditch sites. These values subsequently show an adjustment towards the "control" concentrations further downstream (site number 5). The adjustment is the result of natural bio-chemical degradation and dilution and will likely approach stability relative to the distance from the source of "influence". In viewing the data from the LaVallee River, the same upstream and downstream relationship for concentrations of NH_3, TKN, tannic acid, lignins and pH do not exist. It would seem the more direct drainage provided by the construction of ditches from the harvesting operation to Everett Creek is responsible for the influence experienced at sites number 4 and 5.

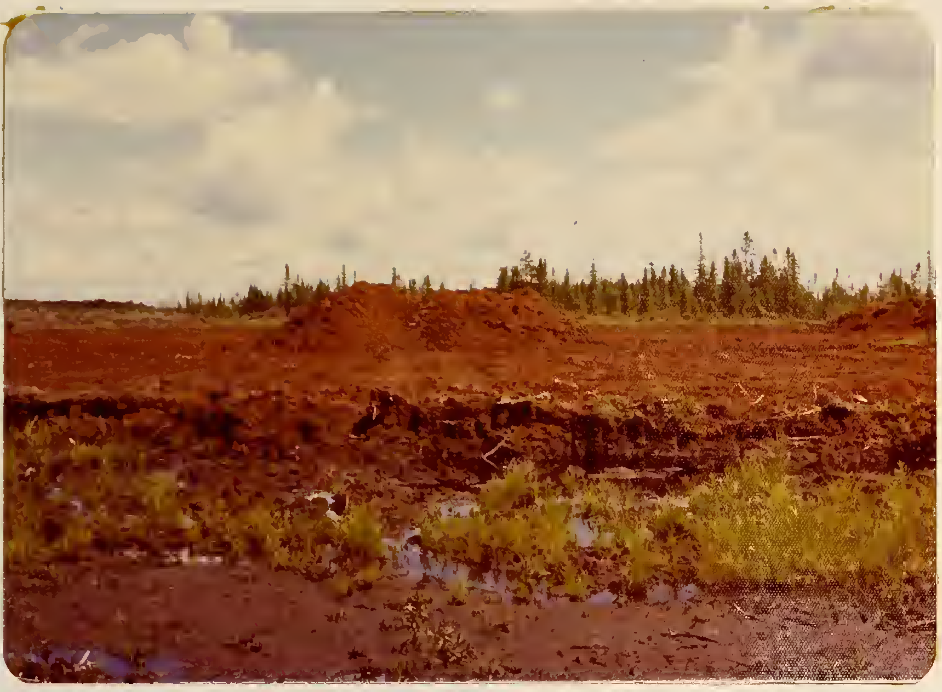
CONCLUSIONS

The artificial chemical loading that Everett Creek experiences from the drainage ditches of the Arctic Peat Moss Limited harvesting operation is measurable but environmentally insignificant. As the discharge from the ditches moves downstream, natural biochemical degradation and dilution further reduce the physico-chemical influence from a development of this magnitude.

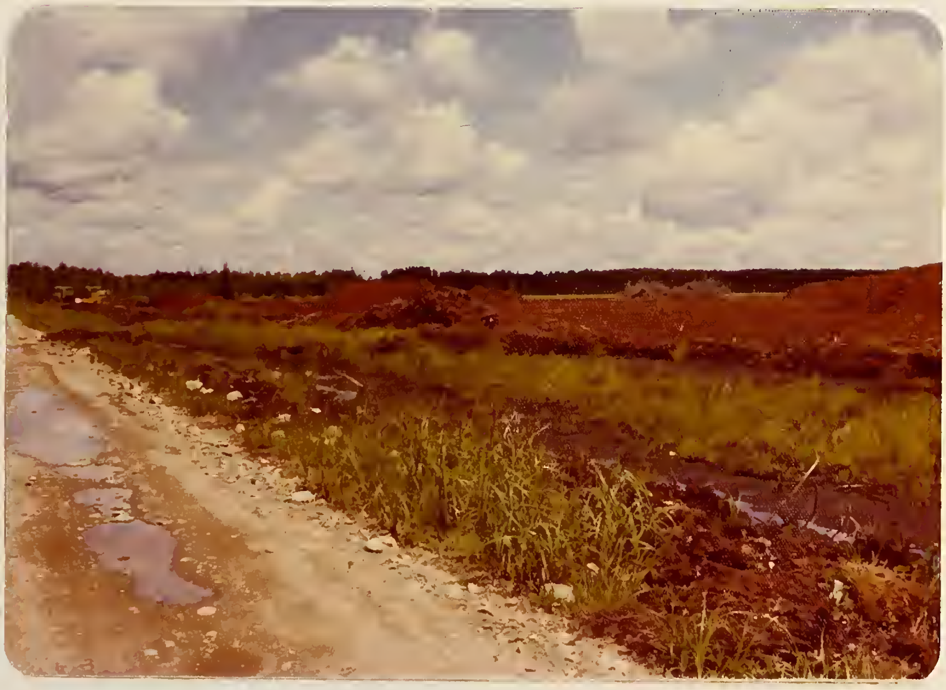
REFERENCES

Heinselman, M.,	Forest sites, bog processes, and peatland types in the glacial Lake Agassiz region, Ecol. Manogr. 33, 4 (1963)
Parihar, N. S.,	Bryophyta, Central Book Depot, Allahabad (1970)
Radforth, N. W.,	Organic terrain organization from the air, Handbook No. 2, Defense Research Board, Canada, Report No. Rd. 124 (1958)

PHOTOGRAPHS



Piled moss undergoing atmospheric drying



Peatlands east of the Barnhart Road

West drainage ditch

(Mire Water)

Sample Site No. 2

Everett Creek

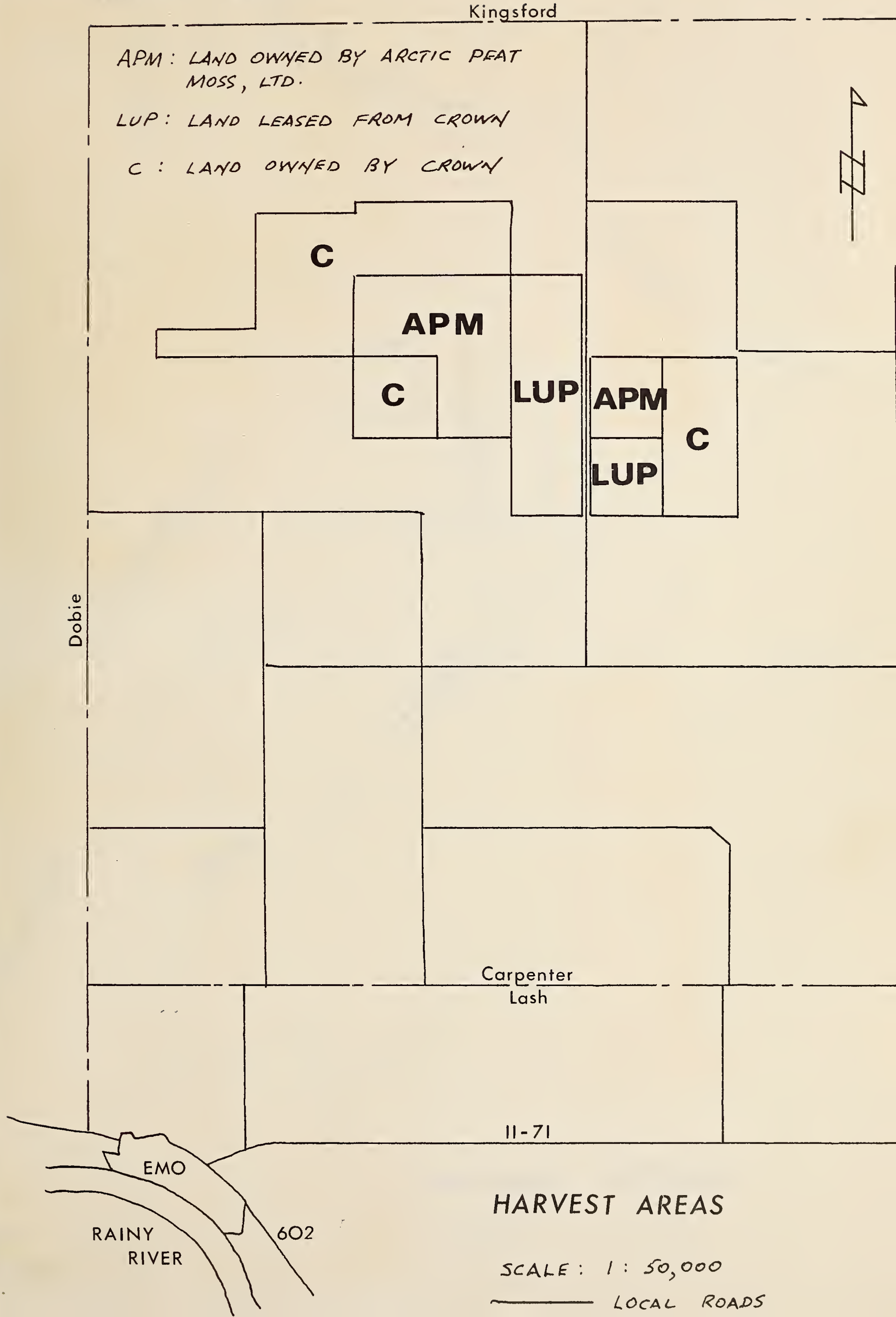
1 Mile Downstream

Sample Site No. 4

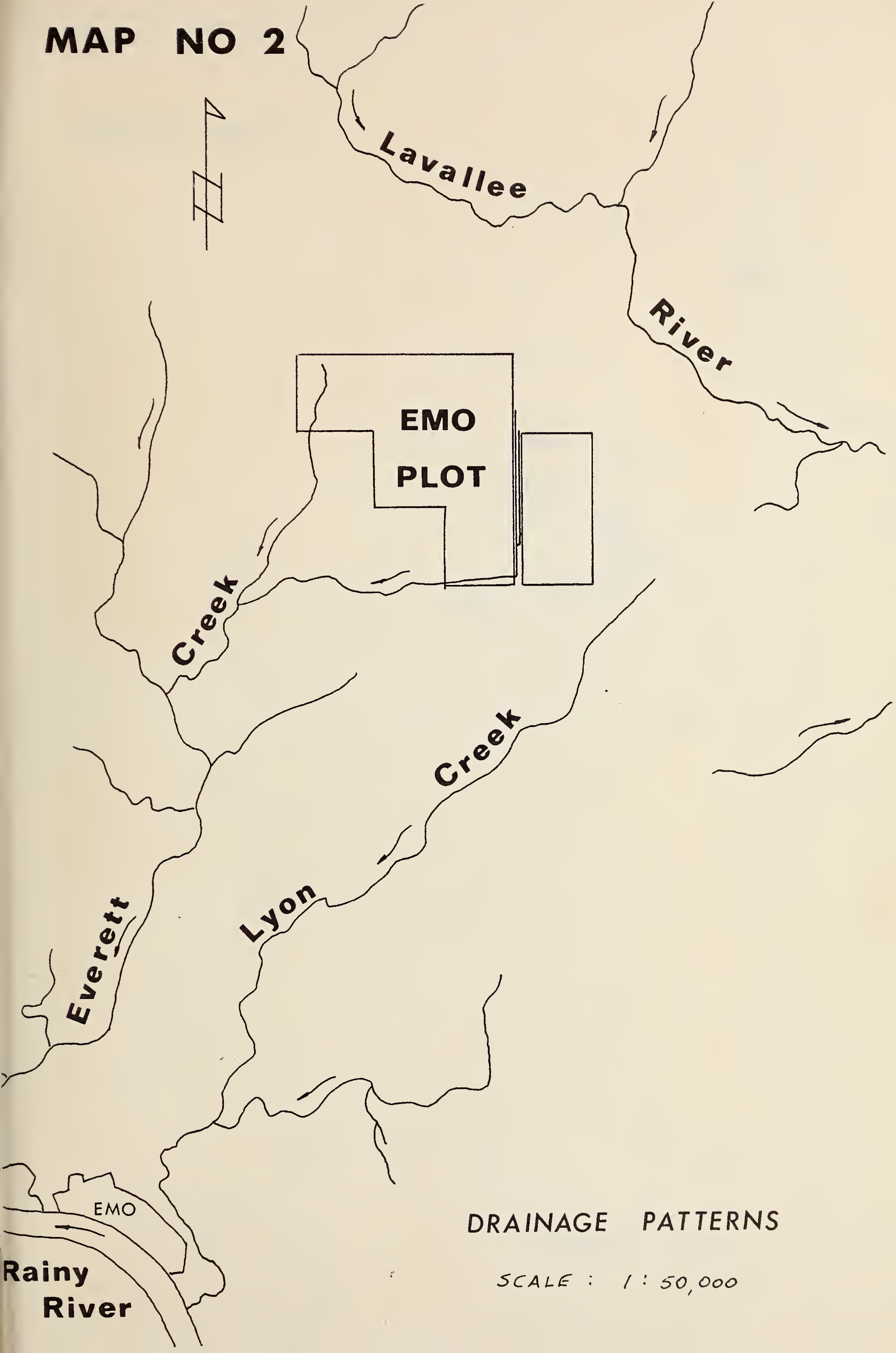
APPENDIX I

MAPS

MAP NO 1


Kingsford
APM : LAND OWNED BY ARCTIC PEAT MOSS, LTD.
LUP : LAND LEASED FROM CROWN
C : LAND OWNED BY CROWN
C
APM
C
LUP
APM
LUP
C
Dobie
Carpenter
Lash
11-71
EMO
RAINY RIVER
602
HARVEST AREAS
SCALE : 1 : 50,000
LOCAL ROADS

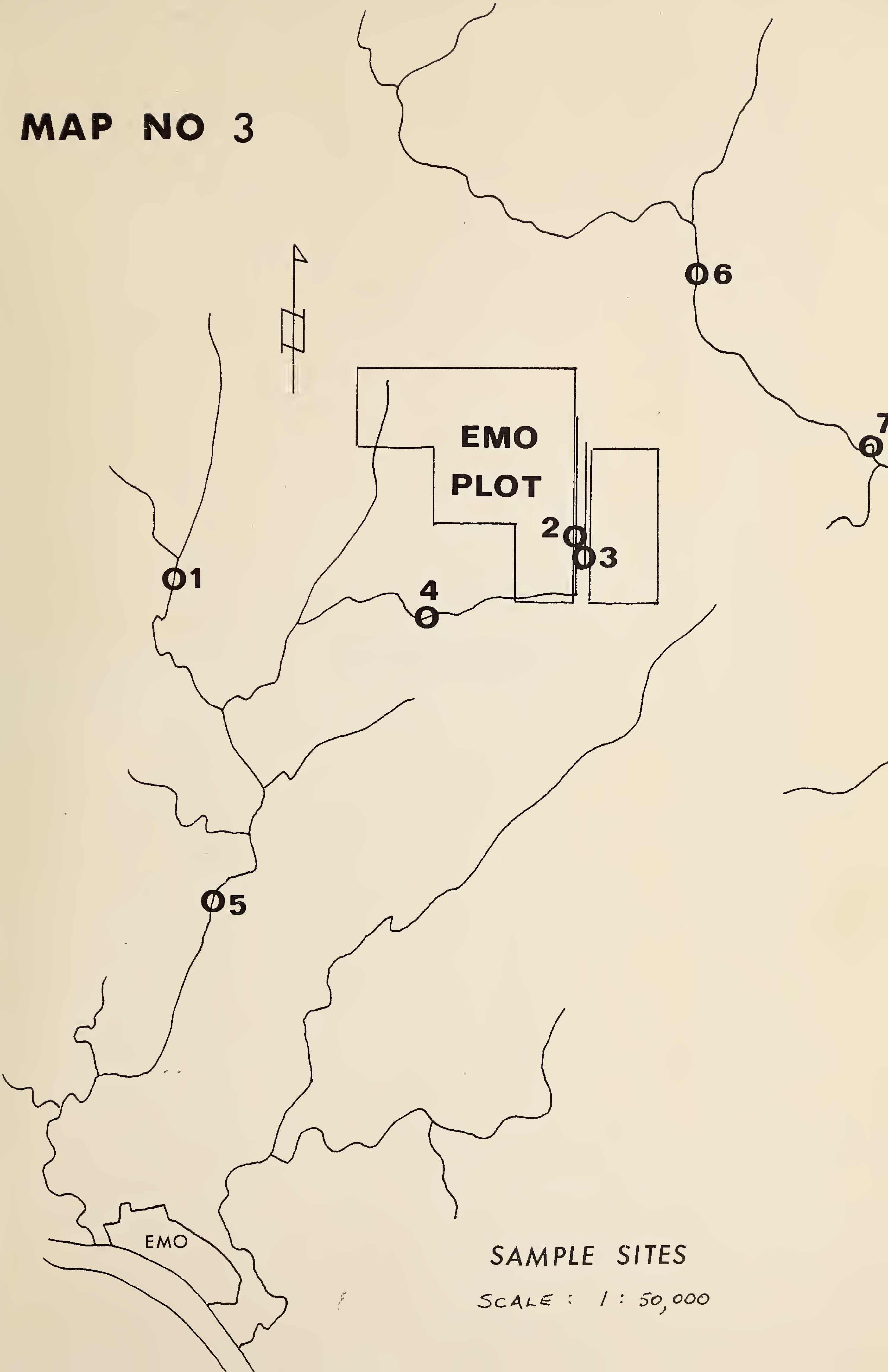
MAP NO 2



DRAINAGE PATTERNS

SCALE : 1 : 50,000

MAP NO 3



SAMPLE SITES

SCALE : 1 : 50,000

APPENDIX II

ANALYTICAL RESULTS

All enelyses except pH reported in mg/litre unless otherwise indicated

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

Municipality: Carpenter

Source: Arctic Peat Moss

Date Sampled: 7/5/76 by: JRB

Report to:
John Barr, Sr. Environmental Officer
Industrial Abatement Section
Ministry of the Environment
808 Robertson Street
KENORA, Ontario P9N 1X9

c.c.

Lab. No.	NITROGEN AS 'N' Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Total Phosphorus as P *	Dissolved Reactive Phosphorus as P*	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	pH at Lab	Conductivity UMHOS/cm	Acidity		
R 455	.06	1.2	.015	.01	.016	.008	52	35	6.1	88	4		
56	.06	1.6	.021	.02	.044	.011	52	33	5.8	84	10		
57	.06	1.2	.018	.01	.032	.015	80	53	6.9	142	2		
58	<.01	1.2	.010	<.01	.020	.006	64	51	6.4	114	4		
59	<.01	1.4	.009	<.01	.020	.006	66	53	6.5	126	4		
60	.12	1.1	.021	.01	.024	.008	34	25	5.4	56	12		
61	.09	1.3	.018	.02	.018	.007	36	20	5.3	61	20		

*Low values are reliable to ± .002 mg/1

R 455	1-1	Everett Creek	Upstream
56	4-1	Everett Creek	1 mi. Downstream
57	5-1	Everett Creek	4 mi. Downstream
58	6-1	Lavallee River	Upstream
59	7-1	Lavallee River	1 mi. Downstream
60	2-1	Drainage Ditch	West
61	3-1	Drainage Ditch	East

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Carpenter

Source: Arctic Peat Moss

Date Sampled: 18/5/76 by: JRB

Report to: John Barr, Sr. Environmental Officer
Industrial Abatement Section
Ministry of the Environment
808 Robertson Street
KENORA, Ontario P9N 1X9

c.c.

Lab. No.	Hardness as CaCO3	Alkalinity as CaCO3	pH at Lab	Apparent Colour in Hazen Units	Turbidity in Formazen Units	NITROGEN AS 'N'				Total Phosphorus as P*	Acidity
						Free Ammonia	Total Kjeldahl	Nitrite	Nitrate		
T 438	68	58	6.6	>70	1.7	.07	.90	.005	.03	.011	6
39	84	74	6.6	>70	43.	.23	2.7	.003	.05	.047	14
40	112	94	7.0	>70	13.	.12	1.7	.004	.03	.013	4
41	72	74	6.7	>70	1.3	<.01	1.2	.009	.01	.005	10
42	92	82	6.8	>70	2.3	.08	.95	.009	<.01	.010	4
43	80	86	6.4	>70	3.3	.33	2.8	.007	.03	.011	24
44	96	102	6.6	>70	1.5	.28	1.8	.002	.03	.009	20

*Low values are reliable to ± .002 mg/l

T 438	1-2	Everett Creek	Upstream
39	4-2	Everett Creek	1 mi. Downstream
40	5-2	Everett Creek	4 mi. Downstream
41	6-2	Lavallee River	Upstream
42	7-2	Lavallee River	1 mi. Downstream
43	2-2	Drainage Ditch	West
44	3-2	Drainage Ditch	East

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Carpenter

Source: Arctic Peat Moss

Date Sampled: 28/6/76 **by:** JRB

Report to:
John Barr, Sr. Environmental Officer
Industrial Abatement Section
Ministry of the Environment
808 Robertson Street
KENORA, Ontario P9N 1X9

c.c.

Lab. No.		NITROGEN AS 'N'			Total Phosphorus as P*	Hardness as CaCO3	Alkalinity as CaCO3	pH	Apparent Color in Hazen Units	Turbidity in Formazin Units	Acidity
	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate							
R 1269	.06	1.3	.024	.02	.040	70	41	6.8	>70	3.6	14
70	.10	1.7	.034	.04	.065	120	31	6.2	>70	3.4	18
71	.08	2.0	.028	.03	.15	86	71	6.9	>70	28.	8
72	.01	1.5	.010	.01	.045	80	71	6.4	>70	1.2	14
73	.03	1.1	.010	.01	.060	86	75	6.5	>70	2.1	10
74	.12	1.2	.036	.02	.045	32	12	4.5	>70	.75	30
75	.10	1.4	.032	.02	.045	54	20	5.9	>70	1.3	22

*Low values are reliable to ± .002 mg/1

R 1269	1-3	Everett Creek	Upstream
70	4-3	Everett Creek	1 mi. Downstream
71	5-3	Everett Creek	4 mi. Downstream
72	6-3	Lavallee River	Upstream
73	7-3	Lavallee River	1 mi. Downstream
74	2-3	Drainage Ditch	West
75	3-3	Drainage Ditch	East

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in
mg/litre unless otherwise indicated

Municipality: Carpenter

Source: Arctic Peat Moss

Date Sampled: 27/7/76 **by:** JRB

Report to:
John Barr, Sr. Environmental Officer
Industrial Abatement Section
Ministry of the Environment
808 Robertson Street
KENORA, Ontario P9N 1X9

c.c.

Lab. No.	NITROGEN AS 'N'				Total Phosphorus as P*	Turbidity in Formazin Units	Hardness as CaCO3	Alkalinity as CaCO3	pH at Lab	Apparent Color in Hazen Units	Acidity	Tannic Acid	Lignins
	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate									
R 1888	.07	1.5	.026	.03	.045	3.1	120	58	6.2	>70	15	5	12.5
89	.11	2.2	.036	.04	.080	4.8	104	49	5.6	>70	15	15	37.5
90	.11	1.7	.032	.03	.10	27	200	87	6.9	>70	10	10	25.0
91	.02	1.2	.012	.01	.040	1.0	184	107	6.9	>70	10	5	12.5
92	.01	1.0	.010	.01	.070	1.7	184	107	6.7	>70	10	5	12.5
93	.11	1.4	.036	.04	.055	3.1	112	49	5.6	>70	15	20	50.0
94	.09	1.5	.036	.03	.080	1.4	128	53	5.7	>70	15	20	50.0

*Low values are reliable to ±.002 mg/l

R 1888	1-4	Everett Creek	Upstream
89	4-4	Everett Creek	1 mi. Downstream
90	5-4	Everett Creek	4 mi. Downstream
91	6-4	Lavallee River	Upstream
92	7-4	Lavallee River	1 mi. Downstream
93	2-4	Drainage Ditch	West
94	3-4	Drainage Ditch	East

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Carpenter

Source: Arctic Peat Moss

Date Sampled: 16/8/76 **by:** JRB & RSK

Report to:
John Barr, Sr. Environmental Officer
Industrial Abatement Section
Ministry of the Environment
808 Robertson Street
KENORA, Ontario P9N 1X9

c.c.

Lab. No.	NITROGEN AS 'N'				Total Phosphorus as P*	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	pH at Lab	Apparent Color in Hazen Units	Turbidity in Formazin Units	Acidity	Tannic Acid	Lignins
	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate									
R 2139	.08	1.7	.026	.01	.062	84	74	6.7	>70	9.0	10	10	25.0
40	.10	1.8	.031	.02	.062	60	50	6.2	>70	1.3	12	20	50.0
41	.08	1.6	.028	.01	.074	104	94	7.1	>70	18	10	15	37.5
42	.03	1.4	.010	<.01	.062	84	90	6.4	>70	1.4	12	5	12.5
43	.05	1.4	.009	<.01	.074	108	104	6.6	>70	1.0	12	5	12.5
44	.13	1.9	.038	.02	.078	60	58	5.8	>70	1.0	24	20	50.0
45	.44	2.7	.026	.01	.080	132	124	6.2	> 70	1.2	44	25	50.0

*Low values are reliable to ±.002 mg/l

R 2139	1-5	Everett Creek	Upstream
40	4-5	Everett Creek	1 mi. Downstream
41	5-5	Everett Creek	4 mi. Downstream
42	6-5	Lavallee River	Upstream
43	7-5	Lavallee River	1 mi. Downstream
44	2-5	Drainage Ditch	West
45	3-5	Drainage Ditch	East

MINISTRY OF THE ENVIRONMENT
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in mg/litre unless otherwise indicated

Municipality: Carpenter

Source: Arctic Peat Moss

Date Sampled: 12/10/76 by: JRB

Report to: John Barr, Sr. Environmental Officer
Industrial Abatement Section
Ministry of the Environment
808 Robertson Street
KENORA, Ontario P9N 1X9

c.c.

Lab. No.	Apparent Color in Hazen Units	Turbidity in Formazin Units	NITROGEN AS 'N' Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Total Phosphorus as P*	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	pH at Lab	Acidity	Tannic Acid	Lignins
R 2937	>70	43.	.08	1.8	.038	.05	.18	123	111	6.8	8	6	15.0
38	>70	1.3	.01	.90	.014	.03	.090	73	71	6.5	4	6	15.0
39	>70	4.8	.03	1.2	.026	.02	.21	227	219	7.3	8	8	20.0
40	>70	1.4	.01	.90	.006	.01	.060	106	104	6.8	3	2	5.0
41	>70	2.5	.01	.70	.009	.01	.070	86	83	6.9	3	3	7.5
42	>70	2.9	.52	3.0	.014	.01	.15	176	169	6.7	14	8	20.0
43	>70	1.8	3.5	4.8	.012	<.01	.10	196	223	6.5	46	8	20.0

*Low values are reliable to ±.002 mg/1

Lab. No.			
R 2937	1-6	Everett Creek	Upstream
38	4-6	Everett Creek	1 mi. Downstream
39	5-6	Everett Creek	4 mi. Downstream
40	6-6	Lavallee River	Upstream
41	7-6	Lavallee River	1 mi. Downstream
42	2-6	Drainage Ditch	West
43	3-6	Drainage Ditch	East

Date Due

Ontario. Ministry of the N57
Environment. Northwestern......
MOE/CARP/ASS/ASJK
Assessment of 1976 peat moss
harvesting activities on water
quality. Artic Peat Moss
Limited. Unorganized ....

DATE	C.1 ISSUED TO ASJK
JAN 2 0 1979	G. Scott - N. Bay
FEB 1 2 1979	G. Clarke - Ottawa
MAR 2 6	R.J Milligan 1-4.

MOE/CARP/ASS/ASJK
Ontario Ministry of the En
Assessment of 1976
peat harvesting
asjk
c.1 a aa

LABORATORY LIBRARY
MINISTRY OF THE ENVIRONMENT

PRINTED IN CANADA